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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/086,605	03/01/2002	Shinn-Sheng Yu	67,200-523	1950

7590 11/28/2003

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EXAMINER

SAGAR, KRIPA

ART UNIT	PAPER NUMBER
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1756

DATE MAILED: 11/28/2003

2

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-2

Office Action Summary

Application No.

10/086,605

Applicant(s)

YU, SHINN-SHENG

Examiner

Kripa Sagar

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figures 1-4 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-10, 16-20 are rejected under 35 U.S.C. 102(b) as being anticipated by US Pat.5700601 to Hasegawa et al.

Claims 1-10 recite a photomask with assist features and the shape, structure and disposition of the assist features.

Hasegawa teaches the elements of claims 1-10. These include an *isolated contact* (Fig.9), surrounded by assist features which are *identical in shape* to the contact and are *symmetrically* disposed around the main feature. They are *smaller* than

the main pattern and *similar to each other*. The assist features *improve the depth of focus* of the main pattern (22;41-23;18). In one embodiment Hasegawa places *eight assist features* [cl.2,3] symmetrically [cl.4] around the main pattern (Fig.10) that are *substantially similar in shape* to each other [cl.6] and to the main pattern [cl.7], smaller and equidistant from the main pattern (23;5-18). Hasegawa teaches how to size the auxiliary pattern (21;37-43). In one embodiment the auxiliary pattern is 20% the size [cl.5] of the main pattern (20;46-49). The method of placing auxiliary features [cl.8,9,10] near isolated contacts(fig.9) and semi-dense and random contacts are taught (fig.7,8,12).

Thus Hasegawa teaches all the elements of claims 1-10.

Claims 16-20 recite a semiconductor device formed using a mask with assist features. No unique functions or features of the device are disclosed or claimed.

Hasegawa teaches a semiconductor device formed using a mask carrying assist features (25;33-43). The mask is similar to the instant claimed mask as shown above; the device fabricated by the cited reference is expected to function as well as the instant claimed device.

4. Claims 1-15 are further rejected under 35 U.S.C. 102(e) as being anticipated by 6004699 to Yasuzato et al.

Yasuzato (1;10-20;19) teaches all the elements of the instant claims including forming assist features around a main pattern. The assist features meet all the recited limitations (Fig.8, 25). Fig.8 shows a *semi-dense pattern* which admits 8 assist features on all sides. The features *similar in shape* but *smaller* than the main feature and are

designed not to print. They are arranged *equidistant* from the main pattern, are the *same size* and *symmetrically* placed. The main patterns are 0.2 μm . wide whereas the auxiliary patterns are 0.15 μm . (13;64-14;34). The reference teaches that OAI, when used with assist features surrounding an isolated feature, improves the contrast and depth of focus (abstract). This is similar to dense periodic patterns.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa in view of admitted prior art.

Claims 11-15 recite a method of making the above photomask for use with off-axis illumination.

Hasegawa teaches a method of making the photomasks of his invention (Figs. 11,13,18-22). It does not teach the use of OAI or designing masks for this purpose. However Applicant admits that use of OAI is known to improve the focus latitude of sparse contacts when flanked by assist-features (7;14-19).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use OAI as admitted by Applicant with Hasegawa's mask

because it is known in prior art that this exposure technique improves the process windows of dense and isolated features.

Conclusion

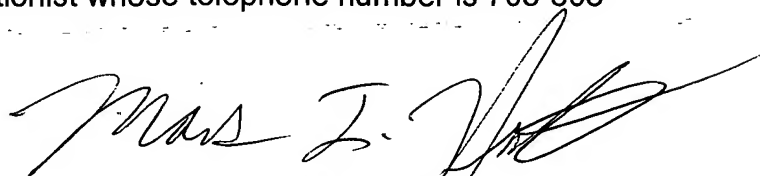
7. Applicant has (i) asserted that conventionally designed assist features do not result in clear definition (p.9;l.16-17) and (ii) stated that the improvement of the instant invention leads to clear definition of assist features and easy mask manufacturability (p.9;18-10;6). Applicant has not provided any data to support the first assertion. There are no differences between the instant invention and the cited references. The number and disposition of the assist features have not been shown to improve focus latitude, manufacturability. Applicant has not provided any comparative data to support the assertions made in the disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kripa Sagar whose telephone number is 703-605-4427. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on 703-308-2464. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

MH/ks



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
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